

REMARKS

Claims 1, 5, and 19 have been amended to correct typographical errors. The amendments add no new matter. New claims 21-25 have been added. Support for the new claims can be found in the specification and claims as filed, for example, on pages 6-8. The new claims add no new matter. Applicants respectfully request entry of the amendments and new claims.

Rejections Under 35 U.S.C. § 102(b)

The Examiner rejected claims 19 and 20 as allegedly anticipated by Cuif (U.S. Patent No. 6,133,194), asserting that Cuif discloses cerium/zirconium mixed oxides and methods of making them. The Examiner rejected claims 1-5, 11, 12, and 15-18 as allegedly anticipated by Suda (EP 0778071 A1) or obvious over Suda. The Examiner asserted that Suda discloses a catalyst with a particle comprising ceria and zirconia which has large oxygen storage capacity and high adsorption and discharge speed, and methods of making it.

Applicants respectfully disagree with the Examiner, and traverse each of the Examiner's rejections under 102(b). Cuif does not disclose every element of claim 19 or claim 20. Cuif does not disclose using a hydrogen-containing atmosphere in a process for preparing an oxygen storage material, wherein an oxide/hydroxide/carbonate dried mixture is treated under a hydrogen-containing atmosphere at a temperature of 600 to 900 °C for a period of 1 to 10 hours. Cuif is silent regarding heat treatment under a reducing atmosphere. To the contrary, Cuif discloses calcining the precipitates under air. Applicants submit that Cuif does not disclose each and every element of claim 19 or claim 20, and thus does not anticipate claim 19 or claim 20.

Applicants submit that Suda does not disclose every element of claim 1. Claim 1 includes a process comprising first preparing a hydroxidic precursor of a mixed oxide using a wet-chemical route, drying at 80 to 300 °C with the formation of an oxide/hydroxide/carbonate dried mixture, and treating the dried mixture at 600 to 900 °C. In contrast, Suda discloses drying the precipitate at a temperature of not less than 100 °C (Suda, page 8, line 40). Applicants submit that Suda does not disclose each and every element of claim 1, and thus does not anticipate claim 1.

Applicants submit that Suda does not disclose every element of claim 5. Claim 5 includes using a pre-made oxide/hydroxide/carbonate mixture of cerium and zirconium and/or silicon. As taught in the application as filed and presently claimed (see, for example, U.S. 2002/0042342 A1, paragraphs [0019], [0020], [0023], and claim 5), a pre-made mixture is converted by thermal treatment under reducing conditions. Suda does not disclose using a pre-made oxide/hydroxide/carbonate mixture. Applicants submit that Suda does not disclose each and every element of claim 5, and thus does not anticipate claim 5.

Rejections Under 35 U.S.C. § 103(a)

The Examiner rejected claims 1-5, 11, 12, and 15-18 as allegedly obvious over Suda (EP 0778071 A1). The Examiner asserted that Suda discloses a ceria and zirconia catalyst and a method of making it. The Examiner rejected claims 6-10 and 13 as allegedly obvious over Suda and Hedouin (U.S. 6,475,452 B1). The Examiner asserted that Suda discloses an oxygen storage material of 0.5-20 wt% of at least one other metal, and metal promoters and noble metals. The Examiner conceded that Suda does not disclose specific promoter metals or their weight percentages. The Examiner asserted that Hedouin discloses a cerium/zirconium mixed oxide that may comprise

praseodymium, samarium, neodymium, and gadolinium at a weight ratio of between 5 and 30%. The Examiner asserted it would have been obvious to modify Suda by having an oxygen storage component comprised of 0.5 to 20 wt% of at least one other metal based on Hedouin. The Examiner rejected claim 14 as allegedly obvious over Suda and Cuif. The Examiner asserted that Suda discloses making mixed oxides of cerium and zirconium by co-precipitation, but Cuif discloses making cerium/zirconium mixed oxides by precipitation and co-thermohydrolysis. The Examiner asserted it would have been obvious to modify Suda by making mixed oxides by thermohydrolysis, based on Cuif.

Applicants respectfully disagree with the Examiner and traverse each rejection under 103(a). Suda discloses a method of drying a precipitate "at the temperature of not less than 100 °C" (Suda, page 8, line 40), yet teaches away from Applicants' claimed temperature range:

It is preferable that the precipitate is dried at the temperature of not less than 100 °C, more preferably, not less than 200 °C, **most preferably, not less than 300 °C** because ammonium nitrate which is formed by neutralization is easily decomposed and removed.

(Suda, at page 8, lines 40-43). In contrast, the invention as presently claimed includes drying a hydroxidic precursor of a mixed oxide at a temperature from 80 to 300 °C.

Suda discloses heating the precipitate at 150 – 600 °C (Suda, page 9, line 44). In contrast, the invention as presently claimed includes treating the dried oxide/hydroxide/carbonate mixture at a temperature from 600-900 °C for 1 to 10 hours. Suda teaches away from Applicants' claimed temperature range:

When the heating temperature is less than 150 °C, the oxide is hardly obtained. When the heating temperature is more than 600 °C, the obtained oxide is sintered, and there is fear

that the particles are aggregated.

(Suda, at page 8, lines 44-46). Thus, Applicants submit that Suda cannot be fairly read as rendering Applicants' presently claimed range obvious, since Suda unambiguously steers the reader away from Applicants' presently claimed ranges.

With regard to the new claims 21 to 25, Applicants submit that Suda does not disclose an oxygen storage material produced by a process comprising treating a pre-made mixed oxide of cerium and zirconium and/or silicon with a loss on ignition of more than 6 wt. % and a specific surface area of more than $140 \text{ m}^2/\text{g}$ under a hydrogen-containing atmosphere at a temperature between 600 and 900 °C for a period of 1 to 10 hours. The new claims are based on applicant's specification pages 6 to 8.

Mixed oxides of cerium and zirconium and/or silicon are widely used in the catalyst art and are therefore commercially offered by several suppliers. It was found by applicant's inventors that oxygen storage capacity and the dynamic behavior of such commercially available materials can be improved substantially by a reductive heat treatment when the starting mixed oxide fulfills two conditions: The loss on ignition must be more than 6 wt.-% and the specific surface area must be larger than $140 \text{ m}^2/\text{g}$.

Applicants submit that Suda does not disclose, teach, or suggest ameliorating a commercially available cerium/zirconium mixed oxide, as presently claimed in new claims 21 to 25. Thus, Applicants submit that claims 21 to 25 are not obvious in light of Suda.

Applicants respectfully disagree with the Examiner that Suda, in combination with Hedouin, renders the invention as presently claimed obvious, for the reasons stated above. Applicants submit that Hedouin, combined with Suda, does not cure the infirmities of Suda with respect to Applicants' arguments against Suda above. Further,

Applicants submit that there is no motivation in Suda or Hedouin to combine the disclosure of Suda with the disclosure of Hedouin.

Suda deals with oxygen storage materials having large oxygen storage capacity and high oxygen adsorption and discharge speed (see Abstract of Suda). Hedouin deals with compositions for trapping NO_x from the exhaust gas. Hedouin adds manganese, terbium, gadolinium, *etc.* to a support of cerium/zirconium oxide in order to improve the NO_x storage capacity. There is no indication in Hedouin that the addition of these elements to cerium/zirconium oxide will also improve oxygen storage capacity of the resulting material. Therefore it is not reasonable to combine Suda with Hedouin.

Similarly, Applicants respectfully disagree with the Examiner that Suda, in combination with Cuif, renders the invention as presently claimed obvious, for the reasons stated above. Applicants submit that Cuif, combined with Suda, does not cure the infirmities of Suda with respect to Applicants' arguments against Suda above. Further, Applicants submit that there is no motivation in Suda or Hedouin to combine the disclosure of Suda with the disclosure of Cuif.

Conclusion

In view of the foregoing amendments, and the remarks set forth above, reconsideration and allowance are respectfully solicited.

Enclosed is a petition and fee for a three-month extension of time, including a check for \$950. Also enclosed is a Fee Transmittal, authorizing a charge of \$176.00 to our Deposit Account to cover the fees for new claims 21-25. No additional fee is believed to be due with respect to the filing of this amendment. If any additional fees are due, or an overpayment has been made, please charge, or credit, our Deposit Account No.

Applicant: Mussmann *et al.*
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11-0171 for such sum.

If the Examiner has any questions regarding the present application, the Examiner is cordially invited to contact Applicant's attorney at the telephone number provided below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Tor Smeland", written over a horizontal line.

Tor Smeland

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